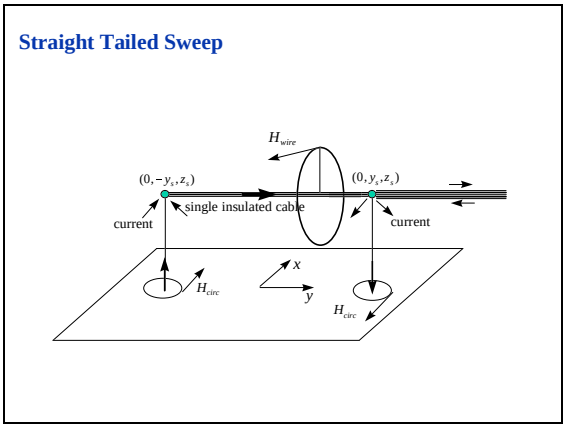
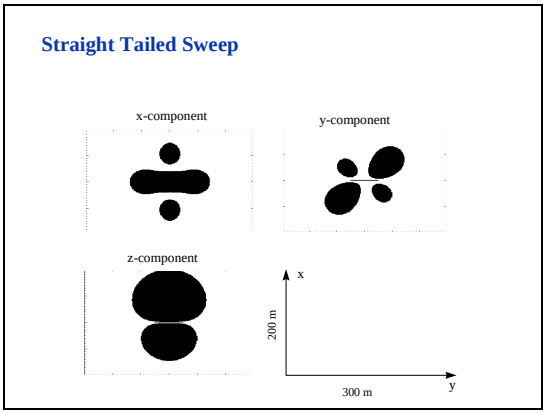
Ocean Bottom Conductivity Database Development

Marshall Bradley
115 Christian Lane
Slidell, LA 70458
504 649 0450 (voice)
504 649 0480 (fax)
marshall.bradley@psislidell.com
Contract: N00014-93-C-6003
http://www.psislidell.com

LONG TERM GOALS

The Office of Naval Research has sponsored the development of a performance prediction capability for magnetic minesweeping. The N-Layered Magnetic Model is used to predict the expected performance of U.S. Navy magnetic minesweeping equipment. This model has been accepted by the Oceanographic and Atmospheric Master Library (OAML) as the standard model for computing the magnetic fields generated by U.S. sweeps and other equipment.





One required environmental input to the N-Layered Model is conductivity versus depth in the ocean bottom. This type of oceanographic data is not readily observable. Historically, it has been obtained by conducting ocean bottom resistivity surveys using the MACAS system. MACAS data, however, is not available for many critical areas. The MACAS system is highly accurate, but is expensive to deploy and use and is not suitable for data acquisition in denied-access areas.

OBJECTIVES

We have developed a technique for estimating conductivity versus depth in the ocean bottom using historical oceanographic and ocean bottom geophysical data. The object of our FY98 effort is to refine this technique so that it may be used to populate data bases of electrical reflection coefficient *Q* and the electrical depth *ED* in areas for which no MACAS data is available.

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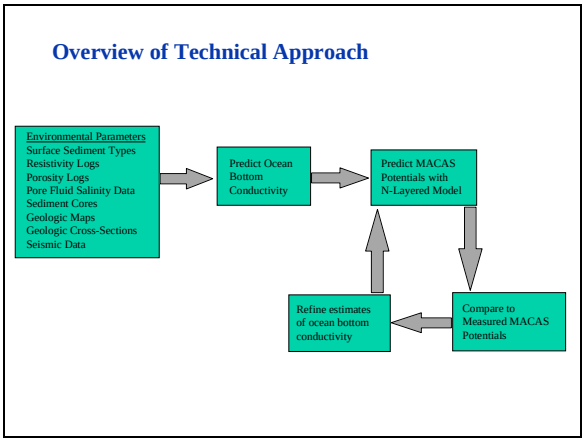
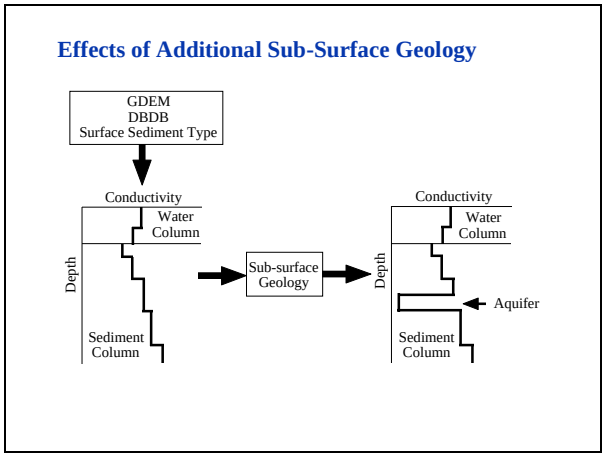
APPROACH

By the end of FY 97, we had devised and used algorithms which required inputs such as well log and well core data, as well as geophysical seismic survey data. During 1998, efforts have focused on algorithm improvement and validation, and on adapting algorithms for use in areas where well data is not available. In particular, we are extending our technique so that it can be reliably used in several high priority areas, including the Persian Gulf and waters off Korea, where sub-bottom features strongly impact electrical propagation conditions.



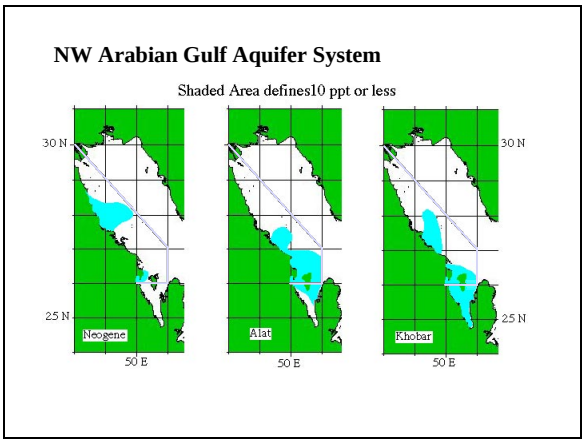


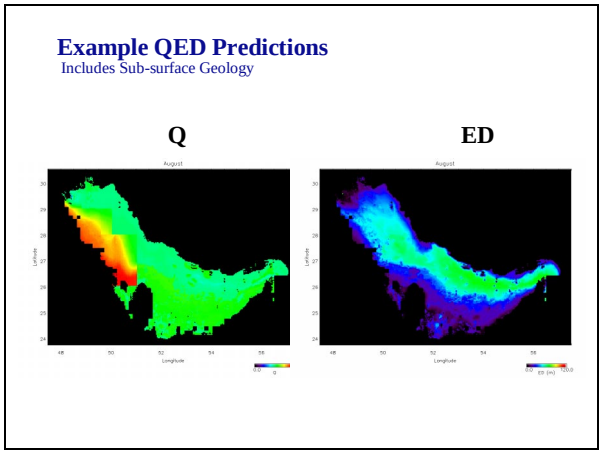
WORK COMPLETED

A database of the Northern end of the Persian Gulf has been completed; current efforts are focused on its extension to the lower limits of that area. We have used a wide range of environmental information for this development effort, including both NAVOCEANO-provided survey data and 'non-traditional' information.

RESULTS

To date, good agreement has been achieved between our results, obtained using our databases, and data measured directly by MACAS. Detailed analysis of sub-bottom geology revealed the presence of aquifers in the Persian Gulf region; the incorporation of these aquifers into our geophysical models was necessary in order to achieve the desired agreement with the MACAS data. A detailed technical briefing is available which discusses this in more detail.





IMPACT/APPLICATIONS

The development of ocean bottom conductivity databases will permit the application of ONR's N-Layered Magnetic Model as a tool in performance assessment and mission planning for Mine Warfare.

TRANSITIONS

This work has been briefed to both the Naval Oceanographic Office and the COMINEWARCOM staff. It is anticipated that, after a scientific procedure has been developed and fully validated, ONR will transition that procedure and preliminary databases and work to the Naval Oceanographic Office, for full-scale (world-wide) database production.

RELATED PROJECTS

ONR Warfare Effectiveness Program (E. Chaika, POC) - this effort developed the N-Layered Magnetic Model.

Naval Oceanographic Office (S. Haegar, POC) - this effort is examining the applicability of ONR algorithms for developing 'world-wide' databases.

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